

Application Number 10/820,584
Responsive to Office Action mailed December 12, 2005

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims:

Claim 1 (Currently Amended): A radio-frequency identification (RFID) tag comprising:
a main antenna tuned to a first resonant frequency; ~~and~~
switching circuitry that dynamically changes the resonant frequency of the main antenna;
and
a sensing circuit to sense electromagnetic coupling with a neighboring RFID tag
and activate the switching circuit in response to the sensed electromagnetic coupling.

Claim 2 (Original): The RFID tag of claim 1, further comprising a capacitive element, wherein the switching circuitry selectively electrically couples the capacitive element to the main antenna to change the resonant frequency of the main antenna.

Claim 3 (Original): The RFID tag of claim 2, wherein the switching circuitry couples the capacitive element in parallel with the main antenna to reduce the resonant frequency of the main antenna.

Claim 4 (Original): The RFID tag of claim 2, wherein the capacitive element comprises one of a capacitor, a diode, and a transistor.

Claim 5 (Original): The RFID tag of claim 1, further comprising an inductive element, wherein the switching circuitry selectively electrically couples the inductive element to the main antenna to dynamically change the resonant frequency of the main antenna.

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Claim 6 (Original): The RFID tag of claim 1, further comprising:

a first conductive trace of a first length; and

a second conductive trace of a second length, wherein the first length is greater than the second length, and further wherein the switching circuitry selectively couples the first conductive trace or the second conductive trace to the main antenna to change the resonant frequency of the main antenna.

Claim 7 (Original): The RFID tag of claim 1, wherein the switching circuitry comprises a microelectromechanical system (MEMS) switch that selects different electrical elements to change the resonant frequency.

Claim 8 (Original): The RFID tag of claim 1, wherein the switching circuitry comprises a capacitive switch that changes the resonant frequency of the main antenna based upon a stored charge.

Claim 9 (Currently Amended): The RFID tag of claim 1, ~~further comprising a~~ wherein the sensing circuit senses an amount of electromagnetic coupling with the [[a]] neighboring RFID tag, and activates wherein the switching circuit to selectively increase[[s]] or decrease[[s]] the resonant frequency of the main antenna based on the sensed amount of electromagnetic coupling.

Claim 10 (Currently Amended): The RFID tag of claim 1 9, wherein the switching circuitry comprises a transistor that turns on when a current in the sensing circuit exceeds a threshold value.

Claim 11 (Currently Amended): The RFID tag of claim 1 10, wherein the switching circuitry further comprises a first resistor and a second resistor arranged to realize a voltage divider to regulate the threshold value at which the transistor turns on.

Claim 12 (Original): The RFID tag of claim 1, further comprising a sensing antenna tuned to a second resonant frequency, wherein the switching circuitry changes the resonant frequency of the main antenna based on an amount of current induced within the sensing antenna.

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Claim 13 (Original): The RFID tag of claim 12, wherein the main antenna and the sensing antenna are coplanar.

Claim 14 (Original): The RFID tag of claim 12, wherein the sensing antenna is tuned to approximately 13.56 megahertz (MHz) and the main antenna is tuned to approximately 20 MHz.

Claim 15 (Original): The RFID tag of claim 1, wherein the switching circuitry automatically changes the resonant frequency of the main antenna upon application or removal of a radio frequency field to the RFID tag.

Claim 16 (Original): The RFID tag of claim 1, further comprising an RFID integrated circuit electrically coupled to the main antenna that stores information of an associated article and communicates the information to an RFID reader via the main antenna.

Claim 17 (Currently Amended): A method comprising:

operating a main antenna of a radio frequency identification (RFID) tag at an associated resonant frequency; and

sensing an amount of electromagnetic coupling between the RFID tag and a neighboring RFID tag; and

dynamically changing the resonant frequency of the main antenna based on the sensed amount of electromagnetic coupling.

Claim 18 (Original): The method of claim 17, wherein dynamically changing the resonant frequency comprises selectively coupling a capacitive element to the main antenna to selectively increase or decrease the resonant frequency of the main antenna.

Claim 19 (Original): The method of claim 18, wherein the capacitive element comprises one of a capacitor, a diode, and a transistor.

Claim 20 (Original): The method of claim 17, wherein dynamically changing the resonant frequency comprises selectively coupling an inductive element to the main antenna to change the resonant frequency of the main antenna.

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Claim 21 (Original): The method of claim 17, wherein dynamically changing the resonant frequency comprises selectively coupling a first conductive trace of a first length or a second conductive trace of a second length to the main antenna to change the resonant frequency of the main antenna.

Claim 22 (Canceled).

Claim 23 (Currently Amended): The method of claim 17, wherein the RFID tag includes a sensing antenna having a resonant frequency different from the resonant frequency associated with the main antenna, and wherein dynamically changing the resonant frequency comprises dynamically changing the resonant frequency associated with the main antenna when a current induced in the [[a]] sensing antenna exceeds a threshold value.

Claim 24 (Original): The method of claim 23, wherein the resonant frequency of the sensing antenna is tuned to approximately 13.56 megahertz (MHz) and the resonant frequency of the main antenna is tuned to approximately 20 MHz.

Claim 25 (Original): The method of claim 17, wherein dynamically changing the resonant frequency comprises dynamically changing the resonant frequency of the main antenna upon application or removal of a radio frequency field to the RFID tag.

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Claim 26 (Currently Amended): A radio frequency identification (RFID) system comprising:
an RFID interrogation device;
an RFID tag associated with an article, wherein the interrogation device interrogates the RFID tag to obtain information regarding the article; and
a computing device to process the information retrieved from the RFID interrogation device,

wherein the RFID tag includes a main antenna tuned to a first resonant frequency, an integrated circuit electrically coupled to the main antenna that stores information of the associated article, ~~and~~ switching circuitry that selectively couples one or more elements to the main antenna to adjust the resonant frequency of the main antenna, and a sensing circuit to sense electromagnetic coupling with a neighboring tag and activate the switching circuit in response to the sensed electromagnetic coupling.

Claim 27 (Original): The system of claim 26, wherein the one or more elements includes a capacitive element, and the switching circuitry selectively couples the capacitive element to the main antenna.

Claim 28 (Original): The system of claim 27, wherein the switching circuitry selectively couples the capacitive element in parallel with the main antenna to reduce the resonant frequency of the main antenna.

Claim 29 (Original): The system of claim 27, wherein the capacitive element comprises one of a capacitor, a diode, and a transistor.

Claim 30 (Original): The system of claim 26, wherein the one or more elements includes an inductive element, and the switching circuitry selectively couples the inductive element to the main antenna.

Claim 31 (Original): The system of claim 26, wherein the one or more elements includes a first conductive trace of a first length and a second conductive trace of a second length, and the switching circuitry selectively couples the first conductive trace or the second conductive trace to the main antenna.

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Claim 32 (Original): The system of claim 26, wherein the switching circuitry comprises one of a microelectromechanical system (MEMS) switch and a capacitive switch.

Claim 33 (Currently Amended): The system of claim 26, ~~further comprising a~~ wherein the sensing circuit senses an amount of electromagnetic coupling with a neighboring RFID tag, and activates wherein the switching circuit to selectively couple[[s]] the one or more elements to the main antenna based on the sensed amount of electromagnetic coupling to selectively increase or decrease the resonant frequency of the main antenna.

Claim 34 (Currently Amended): The system of claim ~~26~~ 33, wherein the sensing circuit comprises a sensing antenna tuned to a second resonant frequency different from the first resonant frequency, and the switching circuitry selectively couples the one or more elements to the main antenna when the current in the sensing ~~sense~~ antenna exceeds a threshold value.

Claim 35 (Original): The system of claim 34, wherein the switching circuitry comprises a transistor that turns on when the current in the sensing antenna exceeds the threshold value.

Claim 36 (Original): The system of claim 35, wherein the switching circuitry further comprises a first resistor and a second resistor arranged to realize a voltage divider to regulate the threshold value at which the transistor turns on.

Claim 37 (Original): The system of claim 33, wherein the main antenna and the sensing antenna are coplanar.

Claim 38 (Original): The system of claim 33, wherein the sensing antenna is tuned to approximately 13.56 megahertz (MHz) and the main antenna is tuned to approximately 20 MHz.

Claim 39 (Original): The system of claim 26, wherein the switching circuitry automatically changes the resonant frequency of the main antenna upon application or removal of a radio frequency field to the RFID tag.